DRAFT

Summary of the Proposed Delaware 15% Rate of Progress Plan

as Required by the
Clean Air Act Amendments of 1990
for Demonstrating Progress Toward Attainment
of the National Ambient Air Quality Standard
for Ozone

The Delaware Department of Natural Resources
and Environmental Control
in Conjunction with
The Delaware Department of Transportation

November, 1994

TABLE OF CONTENTS

INTRODUCTION

Background

This document is a summary of Delaware's 15% Rate of Progress Plan (RPP) which addresses Delaware's nonattainment of the National Ambient Air Quality Standard (NAAQS) for ozone, as required by the Clean Air Act Amendments of 1990 (CAAA).[1] The CAAA requires states to submit a plan to the United States Environmental Protection Agency (EPA), for each ozone nonattainment area classified as moderate or above, that achieves a 15 percent net reduction by November 15, 1996, of anthropogenic volatile organic compound (VOC) emissions.[2] This summary briefly describes the key elements in the 15% Rate of Progress Plan.

The NAAQS are air quality standards for pollutants that pose public health risks. Delaware exceeds the standard for only one of these pollutants, ozone. High levels of ozone can harm the respiratory system and cause breathing problems, throat irritation, coughing, chest pains, and greater susceptibility to respiratory infection. Ozone is generally not directly emitted to the atmosphere, but is formed in the atmosphere by a chemical reaction between volatile organic compounds (VOC), oxides of nitrogen (NOx), and carbon monoxide (CO) in the presence of sunlight. Consequently, in order to reduce ozone concentrations, the CAAA requires specific amounts of reductions in anthropogenic (human-caused) VOC emissions and NOx emissions over a specified period of years until the ozone standard is met. The first increment in this reduction process is the requirement to reduce anthropogenic VOC emissions by 15 percent by 1996.

The CAAA defines five nonattainment area classifications for areas that exceed the NAAQS based on the severity of the pollution problem. They are, in order of increasing severity, marginal, moderate, serious, severe, and extreme. Attainment dates and plan submission requirements depend on the classification designation for each area.[3] Delaware's three counties are all in nonattainment of the NAAQS for ozone. As shown in Figure 1, Kent and New Castle Counties fall within the Philadelphia Consolidated Metropolitan Statistical Area (CMSA) which is classified as a severe nonattainment area. Sussex County falls outside the Philadelphia CMSA and is classified as a marginal area. Kent and New Castle are the two counties for which Delaware is required to develop a 15 percent RPP. All discussions and data presented in this summary apply only to Kent and New Castle Counties.

---

[1]Federal Clean Air Act, 42 U.S.C.A. §7401 et seq., as amended by the Clean Air Act Amendments of 1990, P.L. 101-549, November 15, 1990.

[2]Act, Title I, Part D, Sec. 182(d).

[3]Act, Title I, Part D, Sec. 181

PUT FIGURE 1 HERE. **(figure 1-1 from the Base Year Inventory)**

The 15 percent reduction in VOC emissions is based on the 1990 Base Year Ozone Emission Inventory which is an inventory of 1990 actual VOC, NOx, and CO emissions from sources in Delaware. The amount of VOC emissions reduction that the state must achieve to meet the 15 percent requirement is determined from 1990 Base Year emissions levels after accounting for any growth in emissions between the base year (1990) and the target year (1996). In effect, the state must plan to implement control measures that will, by 1996, not only reduce 1990 emissions levels by 15 percent, but also reduce additional emissions that will be produced as a result of economic growth. The plan must show that expected emissions reductions from federal and state control measures to be implemented by 1996 are enough to meet the required 15 percent reduction net of growth.

Responsibilities

The agency with direct responsibility for preparing and submitting the 15 Percent Rate of Progress Plan is the Delaware Department of Natural Resources and Environmental Control (DNREC), Air Quality Management Section (AQM), under the direction of Darryl D. Tyler, Program Administrator. The Delaware Department of Transportation (DelDOT) in conjunction with Vanasse Hangen Brustlin, Inc. was responsible for performing the work associated with the on-road mobile source portions of this plan. Various other state agencies, including the Department of Labor, the Department of Public Safety, and the Department of Agriculture provided information for use in producing the plan.

PART I

1990 BASE YEAR INVENTORY SUMMARY AND 1996 TARGET LEVEL OF VOC EMISSIONS

1990 Base Year Inventory Summary

The nonattainment plan provisions in the CAAA require states in nonattainment areas to submit to the EPA a current inventory of actual emissions from all sources of relevant pollutants.[4] This inventory is to be used as the basis for determining required emissions reductions. The EPA has chosen calendar year 1990 as the time frame for this current emissions inventory which is called the 1990 Base Year Ozone State Implementation Plan (SIP) Emissions Inventory (hereafter referred to as the 1990 Base Year Inventory). Delaware's final 1990 Base Year Inventory was submitted to EPA as a SIP revision on May 27, 1994.

In order to produce a 15 Percent Plan, adjustments must be made to the 1990 Base Year Inventory following EPA guidelines, and a 1996 target level of emissions must be calculated from the Adjusted Base Year Inventory. As a first step in calculating the Adjusted Base Year Inventory and 1996 Target Level for the 15% Rate of Progress Plan, the results of Delaware's final 1990 Base Year Inventory for the severe ozone nonattainment area are summarized below.

The 1990 Base Year Inventory is categorized into point, stationary area, off-road mobile, on-road mobile, and biogenic sources of emissions. Volatile organic compounds (VOC), oxides of nitrogen (NOx), and carbon monoxide (CO) are the ozone precursor emissions reported for each category in the 1990 Base Year Inventory. Because CO is only marginally reactive on producing ozone, the CO component of the 1990 Base Year Inventory does not figure into the 15 Percent Rate of Progress Plan. Therefore, only the VOC and NOx components of the 1990 Base Year Inventory are summarized here. The results of Delaware's 1990 Base Year Inventory are summarized in Table 1 for VOC and NOx emissions from Kent and New Castle Counties. The values in Table 1 are reported in tons per peak ozone season day (TPD). The peak ozone season for Delaware is defined as June 1 through August 31.

The percent VOC contribution of each source component listed in Table 1 to the total VOC emissions from Kent and New Castle Counties is shown in Figure 2. These relative proportions are shown both for the total inventory of all sources, and for the anthropogenic (human-caused) inventory which excludes biogenic emissions. The anthropogenic inventory is the inventory from which the Adjusted Base Year Inventory and the 1996 Target Level of VOC emissions are calculated. These steps in the development of the 15% VOC reduction plan are described in the following section.

---

[4]CAAA, Title I, Part D, Sec. 172(c)(3) and Sec. 182

TABLE 1
1990 BASE YEAR INVENTORY SUMMARY
VOC AND NOx EMISSIONS IN TONS PER DAY FOR THE PEAK OZONE SEASON

Source Category	Emissions per County (TPD)			
	Kent		New Castle	
	VOC	NOx	VOC	NOx
Point Sources	3.242	6.130	27.078	85.767
Stationary Area Sources	12.967	1.202	34.754	5.398
Off-Road Mobile Sources	3.494	7.891	16.674	18.777
On-Road Mobile Sources	13.070	10.620	35.280	27.060
Biogenic Sources	32.460	0.000	17.510	0.000
Total Emissions (TPD)	**65.233**	**25.843**	**131.296**	**137.002**

Figure 2 here.

1996 Target Level of VOC Emissions

The 1996 Target Level of VOC emissions is the maximum amount of anthropogenic (human-caused) VOC emissions allowed in 1996 under the rate of progress requirement. In Delaware, this is the maximum amount of anthropogenic VOC emissions that are allowed in Kent and New Castle Counties in 1996. Delaware calculates its 1996 Target Level to be 115.815 tons per day of VOC emissions. This value was derived according to the Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate of Progress Plans, EPA-452/R-92-005, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, October 1992 (hereafter referred to as the Guidance on the Adjusted Base Year Inventory). Essentially, the 1996 Target Level is determined by subtracting 15% of the emissions from the 1990 Base Year anthropogenic emissions. Prior to calculating this 15% reduction, several adjustments are made to the 1990 Base Year Inventory emissions. The end result of these adjustments is called the 1990 Adjusted Base Year Inventory and is the inventory from which the 15 percent reduction is determined. The derivation of both the 1990 Adjusted Base Year Inventory and the 1996 Target Level are discussed in the following paragraphs.

Calculation of the 1996 Target Level is a five step process:

1) The amount of anthropogenic VOC emissions in the severe nonattainment area (Kent and New Castle Counties) must be determined from the 1990 Base Year Inventory. The result of this step is called the 1990 Rate of Progress Inventory or Baseline Inventory.

2) The VOC emissions reductions that will occur between 1990 and 1996 as a result of the Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP) regulations are subtracted from the 1990 Baseline Inventory determined in the first step. The value derived from these first two steps is the 1990 Adjusted Base Year Inventory.

3) The 1990 Adjusted Base Year Inventory is multiplied by 15 percent to determine the required amount of creditable reductions.

4) The total amount of VOC emission reductions that the State should expect to experience in 1996 is determined by adding the required creditable reductions from step 3 and the non-creditable FMVCP and RVP reductions quantified in step 2.

5) The 1996 Target Level is determined by subtracting the total reductions in step 4 from the 1990 Baseline Inventory of VOC emissions that was determined in step 1. All five steps are discussed in more detail below.

> **Step 1 - Calculation of 1990 Baseline Inventory:** Because the 1996 Target Level is defined as the maximum amount of anthropogenic VOC emissions that are allowed in Delaware's severe nonattainment area in 1996, the first step in calculating the 1996 Target Level is to determine the amount of anthropogenic VOC emissions that occurred

in the severe nonattainment area (Kent and New Castle Counties) in 1990. This baseline is called the 1990 Rate of Progress Inventory or Baseline Inventory, and it comprises the universe of VOC emissions from which all emissions reductions are subtracted.

The 1990 Baseline Inventory is determined by subtracting from the 1990 Base Year Inventory all VOC emissions from outside the severe nonattainment area and all biogenic (naturally occurring) VOC emissions. In addition, perchloroethylene (PERC) emissions are subtracted from the 1990 Base Year Inventory. PERC was originally classified by the EPA as a photochemically reactive VOC for emission inventory purposes. The EPA reclassified PERC as photochemically non-reactive after the 1990 Base Year Inventory was compiled. Because only the photochemically reactive VOC's participate in the formation of ozone, the PERC emissions, which are now considered not to participate in the formation of ozone, are subtracted from the 1990 Base Year Inventory prior to the target level calculation.

1990 Baseline Inventory Calculation:

NOTE: Values in all calculations are in tons per peak ozone season day.

1990 Base Year Total VOC Emissions (Kent and New Castle Counties Only):

Kent County:	65.233
New Castle County:	131.296
Emissions from Outside Nonattainment Area:	None
Total:	196.529

1990 Base Year Biogenic VOC Emissions:

Kent County:	32.460
New Castle County:	17.510
Total Biogenic Emissions:	49.970

1990 Base Year PERC Emissions for Kent & New Castle Counties = 0.716

1990 Baseline Inventory =

1990 Base Year - (Outside Emissions + Biogenic Emissions + PERC Emissions)

1990 Baseline Inventory = 196.529 - (0 + 49.970 + 0.716)

1990 Baseline Inventory = 145.843 TPD

A breakout by source category of the 1990 Baseline Inventory is shown in Table 2.

TABLE 2
1990 BASELINE INVENTORY
VOC EMISSIONS IN TONS PER PEAK OZONE SEASON DAY

Category	Kent County	New Castle County	Total Nonattainment Area
Point Sources	3.242	26.938	30.180
Stationary Area Sources	12.779	34.366	47.145
Off-Road Mobile Sources	3.494	16.674	20.168
On-Road Mobile Sources	13.070	35.280	48.350
Total Emissions (TPD):	**32.585**	**113.258**	**145.843**

Step 2 - Calculation of 1990 Adjusted Base Year Inventory: The next step in the target level calculation is to subtract the VOC emissions reductions that are expected to occur between 1990 and 1996 as a result of the Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP) regulations from the 1990 Baseline Inventory that was calculated in step 1. The result of this step is called the 1990 Adjusted Base Year Inventory. The CAAA specify limits on the creditability of certain VOC emission reductions toward the 15 percent requirement.[5] Control measures that produce emissions reductions which are not creditable toward the 15 percent requirement include the FMVCP and RVP programs. States must plan to achieve the required 15 percent reduction in VOC emissions without counting FMVCP and RVP reductions as part of that 15 percent. However, because VOC emission reductions from the FMVCP and RVP programs will occur between 1990 and 1996, these emission reductions are subtracted from the 1990 Baseline Inventory prior to calculating the required 15 percent reduction, in accordance with the Guidance on the Adjusted Base Year Inventory. This step decreases the baseline from which the 15 percent required reduction is calculated, and consequently lowers the amount of VOC emission reductions that would otherwise be required by 1996.

The FMVCP and RVP VOC emissions reductions that are expected to occur between 1990 and 1996 are determined using the on-road mobile source emissions modeling software, MOBILE 5a, provided by the EPA. The VOC emissions reductions that will occur between 1990 and 1996 as a result of the FMVCP and RVP regulations are

[5]CAAA, Title I, Part D, Sec.182(b)(1)(D)

determined by subtracting the 1990 Adjusted Base Year Inventory of On-Road Mobile Source Emissions from the 1990 Base Year Inventory of On-Road Mobile Source Emissions. This operation is shown below.

	Kent County	New Castle County
1990 Base Year On-Road Mobile Source Emissions	13.070	35.280
1990 Adjusted Base Year On-Road Mobile Source Emissions	- 10.245	- 28.515
FMVCP/RVP Emissions Reductions between 1990 and 1996	2.825	6.765

Total FMVCP/RVP Emissions Reductions = 2.825 + 6.765 = 9.590 TPD

1990 Adjusted Base Year Inventory Calculation:

FMVCP and RVP Reductions = 9.590 TPD

1990 Baseline Inventory from Step 1 = 145.843 TPD

1990 Adjusted Base Year Inv. = 1990 Baseline Inv. - FMVCP/RVP Reductions

1990 Adjusted Base Year Inventory = 145.843 - 9.590

1990 Adjusted Base Year Inventory = 136.253 TPD

Step 3 - Calculation of 15% VOC Reductions: The required 15 percent VOC emissions reduction from the ungrown 1990 baseline is determined by multiplying the 1990 Adjusted Base Year Inventory determined in step 2 by 15 percent (0.15).

Required 15 Percent VOC Reductions = 136.253 x 0.15 = 20.438 TPD

Step 4 - Calculation of Total VOC Emission Reductions (creditable and non-creditable): The 20.438 tons/day value calculated in step 3 is the amount of VOC emissions by which Delaware must reduce its 1990 Adjusted Base Year Inventory in order to meet the 15 percent requirement. It must be emphasized that the 20.438 tons/day required reduction does not yet include the amount of projected growth in emissions by 1996 that must also be offset in the 15% Rate of Progress Plan. This

growth will be calculated in Part II of this Plan.

The CAAA puts some restrictions on the control measures that can be counted towards meeting the 15% reduction requirement. That is, there are a number of control measures that were required prior to 1990 which will cause VOC reductions by 1996, but which cannot be counted towards meeting the 15 percent rate of progress requirement. These non-creditable measures include the pre-Clean Air Act Amendment FMVCP and RVP regulations as previously discussed, Reasonably Available Control Technology (RACT) rule corrections, and Inspection and Maintenance (I/M) program corrections.[6] Delaware proposed revisions to its RACT rules in January 1993, in response to EPA's SIP call which notified Delaware of deficiencies in existing RACT rules. Per Robert J. Taggart, Program Manager of DNREC's Engineering and Compliance Branch, Air Quality Management Section, the revisions to existing Delaware regulations that were proposed in response to EPA's SIP call resulted in no additional emissions reductions. Consequently, there are no non-creditable emissions reductions due to RACT rule corrections in the Plan. Similarly, Delaware has no non-creditable emissions reductions due to I/M program corrections per Raymond H. Malenfant, Program Manager of DNREC's Planning and Community Protection Branch, Air Quality Management Section. Therefore, only the FMVCP and RVP reductions, which were determined to be 9.590 tons/day in step 2, are included in this discussion. Although VOC emission reductions from the FMVCP and RVP regulations are not creditable toward Delaware's required 15 percent reduction, these FMVCP and RVP reductions will occur in addition to the 20.438 tons/day of reductions that Delaware must plan to achieve via other creditable control measures. The maximum amount of anthropogenic VOC emissions allowed in 1996, i.e. the 1996 target level, is the 1990 Baseline Inventory less both the creditable and the non-creditable VOC emission reductions. Therefore, in this step of the target level calculation, the creditable and non-creditable reductions are summed together as follows:

Total creditable and non-creditable reductions = 20.438 + 9.590 = 30.028 TPD

Step 5 - Calculation of 1996 Target Level: The 1996 Target Level of VOC emissions is determined by subtracting the sum of the creditable and non-creditable reductions in step 4, from the 1990 Baseline Inventory calculated in step 1.

1996 Target Level of VOC Emissions = Baseline Inventory - Sum of Reductions

1996 Target Level of VOC Emissions = 145.843 - 30.028

1996 Target Level of VOC Emissions = 115.815 TPD

---

[6]CAAA, Title I, Part D, Sec. 182(b)(1)(D)

In order to meet the 15 percent rate of progress requirement, Delaware's 1996 anthropogenic VOC emissions in Kent and New Castle Counties must not exceed the target level of 115.815 tons per peak ozone season day.

PART II

1996 GROWTH FACTORS AND THE 1996 CURRENT CONTROL PROJECTION INVENTORY

In order to determine the total amount of VOC emissions reductions required by 1996, future emissions levels must be estimated. For this purpose, 1996 growth factors are developed for the various source categories of emissions based on economic indicators. The 1990 baseline emissions are multiplied by these growth factors, and the resulting inventory is called the 1996 Current Control Projection Inventory. **The 1996 Current Control Projection Inventory is an estimation of the amount of VOC emissions that will occur in 1996, if no new emission control measures are implemented between 1990 and 1996.** The difference between the 1996 Current Control Projection Inventory and the 1996 Target Level of Emissions is the total amount of emissions that the state must plan to reduce in order to meet the 15 percent VOC reduction requirement. This section contains a discussion of how the total VOC emissions reduction requirement is determined.

The 1996 Current Control Projection Inventory of VOCs for Kent and New Castle Counties is summarized in Table 3. Also included for comparison purposes in this table is the 1990 Baseline Inventory.

TABLE 3
SUMMARY OF 1996 CURRENT CONTROL PROJECTION INVENTORY
VOC EMISSIONS IN TONS PER PEAK OZONE SEASON DAY

Category	Kent County		New Castle County		Total Nonattainment Area	
	1990 VOC Baseline	1996 VOC Projection	1990 VOC Baseline	1996 VOC Projection	1990 VOC Baseline	1996 VOC Projection
Point Sources	3.242	3.179	26.938	26.647	30.180	29.826
Stationary Area Sources	12.779	13.099	34.366	35.417	47.145	48.516
Off-Road Mobile Sources	3.494	3.788	16.674	17.196	20.168	20.984
On-Road Mobile Sources	13.070	18.290	35.280	43.640	48.350	61.930
Total Emissions:	**32.585**	**38.356**	**113.258**	**122.900**	**145.843**	**161.256**

The Current Control Projection and Baseline VOC data are shown graphically in Figure 3. Figure 4 shows the 1996 Current Control Projection Inventory emissions by county for VOCs.

figure 3 here

figure 4 here

The point, stationary area, and off-road mobile source portions of the 1996 Current Control Projection Inventory are essentially created by multiplying 1990 baseline emissions values by the appropriate growth factors. The on-road mobile source emissions are projected by multiplying emission factors generated using the MOBILE 5a software by projected 1996 vehicle miles traveled (VMT). The remainder of this section is broken down into discussions of the development of growth factors, the methods used to project emissions from the point, stationary area, off-road mobile, and on-road mobile source categories, and calculation of the total required VOC reduction.

Growth Factors

The first step in calculating the 1996 Current Control Projection Inventory is to develop growth factors for all source categories of VOC emissions except on-road mobile sources. Growth factors are ratios which compare the amount of emission-producing activity expected in the projection year (1996) to that which occurred in the base year (1990). Thus, growth factors quantify the proportional increase or decrease that economic growth or decline is expected to have on emission levels from 1990 to the projection year 1996. Because growth in emissions for all source categories cannot be directly determined, growth factors are derived using surrogate measures of growth which are indirect, quantifiable measures of activities that are expected to grow in a manner similar to emissions from the various source categories. For example, growth in gasoline tank truck loading and unloading is related to growth in vehicle miles traveled (VMT), since demand for gasoline determines the need for gasoline transport. Similarly, population growth serves as a good indicator of expected increases in emissions from residential fuel use.

Sources of data used to derive Delaware's growth factors include population statistics from Population Projections, Version 1992.0, Delaware Population Consortium, Dover, DE, January 1992; earnings and employment data by industry type from BEA Regional Projections to 2040, Volumes I, II, and III, U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Washington, D.C., U.S. Government Printing Office, October 1990; and local surveys conducted by the Air Quality Management Section of the Delaware Department of Natural Resources and Environmental Control (DNREC). The growth factors were derived according to Procedures for Preparing Emissions Projections, EPA-450/4-91-019, July 1991, (hereafter referred to as Procedures/Projections), and the Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans, EPA-452/R-93-002, March 1993, (hereafter referred to as the Guidance for Growth/Projections/Strategies), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

For point sources, growth factors are developed for facility level Standard Industrial Classification (SIC) code categories. SIC codes are a series of number codes devised by the federal Office of Management and Budget to classify establishments according to the type of economic activity in which they are engaged. Point source emissions are grouped by two or four digit SIC code for purposes of applying growth factors. For stationary area and off-road mobile sources, growth factors are developed for source classification code (SCC) categories. Source classification codes are a series of number codes developed by EPA to define specific types of VOC or NOx emitting activities. Area source emissions are generally grouped by four

digit SCC code for purposes of applying growth factors. The growth factors are used to develop the point, stationary area and off-road mobile source portions of the 1996 Current Control Projection Inventory. Growth factors are not applicable to the on-road mobile source category because on-road mobile source projections are determined through modeling.

1996 Current Control Projection Methodology

Projection Methodology for Point Sources

Point sources were projected according to the Guidance for Growth/Projections/Strategies. Although point source growth factors are developed based on broad SIC groupings, the projections for the point sources were accomplished on a process-by-process basis because point source VOC controls are generally applied at the process level. Point source emissions are projected using either 1990 actual emissions rates or 1990 allowable emissions rates depending on whether or not a source will be subject to new VOC controls by 1996. Per a memo from John Seitz, Director of EPA's Office of Air Quality Planning and Standards, dated April 13, 1993, emission projections for point sources must be evaluated at allowable emissions rates rather than 1990 actual emission rates for sources that will have new controls by the projection year. The memo also states that projections for sources whose 1990 regulatory limit will not be changed in 1996 can be based on 1990 actual emissions. Therefore, point source emissions were projected using the following two methods:

Method 1: Emissions for point sources that will have new controls by 1996 were determined at allowable emissions rates. Allowable emissions are determined from enforceable (1990 regulatory or permit) emissions rates, anticipated operating rates, and anticipated operating schedules. The 1996 Current Control Projection Inventory emissions for point sources were determined by inserting existing (1990) regulatory or permit conditions and 1990 operating data into the projection equations from Section 6.4 of the Guidance for Growth/Projections/Strategies. These projection equations use controlled emissions factors or process control efficiencies, process operating parameters, growth factors, and rule effectiveness factors to project emissions to 1996. More specifically, for purposes of the 1996 Current Control Projection Inventory:

Controlled Emissions Factors or Process Control Efficiencies are 1990 regulatory or permit limits in the form of mass of emissions per unit time or weight percent emissions reduction for each affected process in the 1990 Baseline Inventory.

Process Operating Parameters are 1990 process throughput values, operating schedules, or emissions rates for each affected process in the 1990 Baseline Inventory.

Growth Factors for point sources are developed for facility level Standard Industrial Classification Codes as previously discussed.

Rule effectiveness is an adjustment to the emissions estimates of regulated sources to account for the fact that all sources are not in compliance with applicable air regulations 100 percent of the time. The rule effectiveness adjustment compensates for underestimates of emissions caused by noncompliance with existing regulations, control equipment downtime, operating problems, and process upsets.

Because the same projection equations are used to determine both the 1996 Current Control Projection Inventory and the 1996 Control Strategy Projection Inventory (discussed in Part III of this summary), sample calculations using the projection equations are presented in Part III of this summary.

Method 2: Point source processes that will not have new controls by 1996 were projected by multiplying the appropriate growth factor for that process times the 1990 actual baseline emissions for that process.

Projection Methodology for Stationary Area and Off-Road Mobile Sources

The 1996 Current Control Projection Inventory for stationary area and off-road mobile sources is determined by multiplying the 1990 Baseline Inventory emissions for each emissions category times the appropriate growth factor.

Projection Methodology for On-Road Mobile Sources

On-road mobile source projections are determined using the EPA's MOBILE 5a software. The on-road mobile source 1996 Current Control Projection Inventory is based on 1990 emissions factors generated by MOBILE 5a and 1996 projected vehicle-miles-traveled (VMT) on the 1990 Delaware roadway network. The projection inventory was developed by Vanasse Hangen Brustlin, Inc. under contract with DelDOT, following similar procedures as were used in the preparation of the on-road mobile source emissions in Delaware's 1990 Base Year Inventory.

The 1996 Current Control Projection Inventory for on-road mobile sources is based on VMT projections made by the network-based travel-demand models for Kent and New Castle Counties. The 1990 and 1996 VMT projections calculated by the travel demand models for each functional class were used to derive a growth factor which was applied to the 1990 VMT estimates from the Highway Performance Monitoring System (HPMS) data. This methodology provides consistency with the 1990 Base Year Inventory methodology, since they are both based on HPMS VMT. The 1990 motor vehicle emission factors used in the 1996 Current Control Projection Inventory were the same as the emission factors used in the 1990 Base Year Inventory.

Calculation of Total Required VOC Emissions Reduction

The total amount of VOC emissions that Delaware must plan to reduce in order to meet the 15% rate of progress requirement is the difference between the 1996 Current Control Projection Inventory and the 1996 Target Level of VOC Emissions. The required reduction is determined as follows:

1996 Current Control Projection Inventory from Table 3 = 161.256 tons VOC/day

1996 Target Level of VOC Emissions from Part I = 115.815 tons VOC/day

Total Required VOC Reduction = 161.256 - 115.815 = 45.441 tons VOC/day

PART III

1996 CONTROL STRATEGY PROJECTION INVENTORY AND CONTROL MEASURES

The 15 percent reduction in VOC emissions net of growth required by the Clean Air Act Amendments of 1990 (CAAA) amounts to 45.441 tons/day for Kent and New Castle Counties as discussed previously. These emission reductions will be accomplished by implementation of new VOC control measures between 1990 and 1996. In order to show that the reductions associated with these new control measures are adequate to meet the 15 percent reduction requirement, the 1990 Baseline emissions are projected to 1996 including the effects of both growth and the new control measures, and the resulting inventory is compared to the 1996 Target Level of VOC emissions. **The inventory that results from projecting 1990 Baseline emissions to 1996 including growth and new controls is called the 1996 Control Strategy Projection Inventory.** The total amount of VOC emissions in the 1996 Control Strategy Projection Inventory must be equal to or less than the 1996 Target Level of VOC emissions in order to show that the new control measures will be adequate to meet the 15 percent rate of progress requirement. The 1996 target level of VOC emissions was calculated in Part I of this summary to be 115.815 tons VOC per day. As shown in Table 4, the total 1996 Control Strategy Projection Inventory of VOC emissions is 115.336 tons/day. The total 1996 Control Strategy Projection VOC emissions value is less than the required 115.815 tons/day 1996 Target Level of VOC emissions. Therefore, the control measures that are included in the 1996 Control Strategy Projection are adequate to meet the 15 percent rate of progress requirement.

TABLE 4
SUMMARY OF 1996 CONTROL STRATEGY PROJECTION INVENTORY
VOC EMISSIONS IN TONS PER PEAK OZONE SEASON DAY

Category	Kent County	New Castle County	Total Nonattainment Area
Point Sources	1.268	21.391	22.659
Stationary Area Sources	10.770	29.832	40.602
Off-Road Mobile Sources	3.722	16.753	20.475
On-Road Mobile Sources	8.030	23.570	31.600
Total Emissions:	23.790	92.546	115.336

1996 Control Strategy Projection Methodology

Projection Methodology for Point Sources

Point sources were projected on a process-by-process basis in accordance with the Guidance for Growth/Projections/Strategies. As explained in Part II of this summary, the method used to project point source emissions is dependent on whether or not a source will have new controls

by 1996. VOC emissions for point sources that will have new controls by 1996 were projected at allowable emissions rates using the same point source projection equations that were used to determine the 1996 Current Control Projection Inventory in Part II. However, the projection data used for the 1996 Control Strategy Projection Inventory differs from that used for the 1996 Current Control Projection Inventory in that the controlled emissions factors, process control efficiencies, emissions rates, and rule effectiveness values for processes that will have new controls by 1996 reflect the controls that will be in place in 1996, instead of those that were in place in 1990. VOC emissions for point sources that will not have new controls by 1996 were projected by multiplying the 1990 actual baseline emissions times the appropriate growth factor.

The following is an example 1996 Control Strategy Projection calculation for a point source process that will have new controls by 1996:

Example Point Source Calculation:

The Delaware Regulations Governing Solid Waste have been revised since 1990 to include requirements for installation of gas control systems at all sanitary landfills. Control efficiencies for each affected landfill were determined based on design data for the proposed gas control systems. For the Cherry Island facility located in New Castle County, a control device efficiency (flare efficiency) of 98% and a capture efficiency of 27.23% were used to project the VOC emissions. The overall control efficiency for the Cherry Island landfill is:

$0.98 \times 0.2723 = 0.2669 = 26.69\%$

Using the emissions projection equation:

$$EMIS_{py} = CRTPOL \times \{[1-(CE_{py}/100)(RE_{py}/100)]/[1-(CEQEFF/100)(RULEFF/100)]\} \times GF\_96$$

where:

$EMIS_{py}$ = Projection Year Emissions (Tons per Peak Ozone Season Day)

CRTPOL = 1990 Base Year Ozone Season Actual Emissions (Tons Per Peak Ozone Season Day)

CE_{py} = Projection Year Control Efficiency (Percent)

RE_{py} = Projection Year Rule Effectiveness (Percent)

CEQEFF = 1990 Base Year Control Efficiency (Percent)

RULEFF = 1990 Base Year Rule Effectiveness (Percent)

GF_96 = 1996 Growth Factor (Dimensionless)

The 1996 projected VOC emissions value for the Cherry Island landfill with the addition of new controls is:

$EMIS_{py}$ = 0.268 x {[1-(26.69/100)(80/100)]/[1-(0/100)(0/100)]} x 1.04

= 0.219 tons VOC/day

Projection Methodology for Stationary Area and Off-Road Mobile Sources

Stationary area and off-road mobile sources that will not be subject to new controls by 1996 are projected by multiplying the 1990 Baseline Emissions for the category by the appropriate growth factor. For stationary area and off-road mobile sources that will be subject to new controls by 1996, the 1996 Control Strategy Projections are determined in a manner similar to the point source 1996 Control Strategy Projections, using projection equations from the Guidance for Growth/Projections/Strategies. The main difference between the point source projections and the stationary area and off-road mobile source projections is that point source emissions are projected on a process-by-process basis as described above, while stationary area and off-road mobile source emissions are projected on a category-wide basis. Therefore, the 1996 Control Strategy Projection Inventory for stationary area and off-road mobile sources is determined using category-wide activity level data versus the process operating data that is used for point source projections.

The stationary area and off-road mobile source projection data reflects 1996 controls and rule effectiveness values. A rule penetration value is also factored into the emissions projection. Rule penetration factors are used in conjunction with rule effectiveness (as defined in Part II of this summary) to adjust regulated stationary area source emissions estimates. Rule penetration is the portion of an area source category that is affected by a regulation. If a regulation applies to only a certain percentage of sources within a source category, a rule penetration factor is applied to ensure that the rule effectiveness adjustment affects only the emissions values for those regulated sources, and not the emissions values for the unregulated sources in the category.

The following is an example 1996 Control Strategy Projection calculation for a stationary area source category that will have new controls by 1996:

Example Stationary Area Source Calculation

Section 34 of Delaware Air Regulation 24 prohibits the manufacture, mixing, storage, use, and application of cutback asphalt during the ozone season. 1996 projected VOC emissions form cutback asphalt with new controls for Kent County were determined using the area source projection equation:

$EMIS_{py}$ = ACTLEV x EMF_{py} x GF_96 x [1 - (CE_{py}/100)(RE_{py}/100)(RP_{py}/100)]/2000

where:

$EMIS_{py}$ = Projection Year Emissions (Tons/Peak Ozone Season Day)

ACTLEV = 1990 Baseline Activity Level (Production Units/Peak Ozone Season Day)

EMF_{py} = Projection Year Emissions Factor (Mass of Pollutant/Production Unit)

GF_96 = 1996 Growth Factor

CE_{py} = Projection Year Control Efficiency (Percent)

RE_{py} = Projection Year Rule Effectiveness (Percent)

RP_{py} = Projection Year Rule Penetration (Percent)

The control efficiency and rule penetration were both determined from Section 34 of Regulation 12 to be 100%. The projected VOC emissions are:

$$EMIS_{py} = \{0.1731 \times 420 \times 0.87 \times [1-(100/100)(80/100)(100/100)]\}/2000 = 0.006 \text{ ton/day}$$

Projection Methodology for On-Road Mobile Sources

The on-road mobile source 1996 Control Strategy Projection Inventory is determined from 1996 emissions factors generated by MOBILE 5a and 1996 projected vehicle-miles-traveled (VMT) on the 1996 Delaware roadway network. The 1996 VMT projections are made using the network-based travel-demand models for Kent and New Castle Counties. The 1990 and 1996 VMT projections calculated by the travel demand models for each functional class were used to derive a growth factor which was applied to the 1990 VMT estimates from the Highway Performance Monitoring System (HPMS) data. This methodology provides consistency with the 1990 Base Year Inventory methodology, since they are both based on HPMS VMT. The on-road mobile source projection inventory was developed by Vanasse Hangen Brustlin, Inc. under contract with DelDOT.

Control Measures

The control measures that Delaware plans to implement to meet the 15 percent rate of progress requirement are listed in Table 5 along with implementation dates for each control measure. VOC emissions reductions from each control measure are listed in tons per day. The total VOC emission reduction for Kent and New Castle Counties is 45.920 tons per peak ozone season day. The amount of VOC reduction that Delaware needs to meet the 15 percent rate of progress requirement is 45.441 tons/day (determined in Part II of this summary). Therefore, the control measures listed in Table 5 are adequate to meet the 15 percent rate of progress requirement.

TABLE 5
CONTROL MEASURES AND EXPECTED VOC EMISSIONS REDUCTIONS FOR THE 15 PERCENT RATE OF PROGRESS PLAN

CONTROL MEASURE	CREDITABLE/ NONCREDITABLE	IMPLEMENTATION DATE	EXPECTED EMISSIONS REDUCTIONS (TONS VOC/DAY)
Point Source Controls:			
RACT "Catch-Ups" in Kent County:			
Solvent Metal Cleaning	Creditable	May 31, 1995	0.582
Surface Coating of Metal Furniture	Creditable	May 31, 1995	0.039
Leaks from Synthetic Organic Chemical, Polymer, and Resin Manufacturing Equipment	Creditable	May 31, 1995	0.004
Subtotal for RACT in Kent County:			0.625
New RACT Regulations:			
Bulk Gasoline Marine Tank Vessel Loading Facilities	Creditable	Dec 31, 1995	1.896
SOCMI Reactor Processes and Distillation Operations	Creditable	Apr 1, 1996	0.024
Batch Processing Operations	Creditable	Apr 1, 1996	0.406
Offset Lithography	Creditable	Apr 1, 1996	0.078
Aerospace Coatings	Creditable	Apr 1, 1996	0.008
Industrial Cleaning Solvents	Creditable	Nov 1, 1996	0.499
Non-CTG RACT	Creditable	May 31, 1995	0.359
Subtotal for New RACT Regulations:			3.270
Benzene Waste Rule	Creditable	Spring 1995	1.733
Sanitary Landfills	Creditable	Oct 9, 1993	0.158
Irreversible Process Changes	Creditable	Jan 1, 1996	1.381
Total Point Source Reductions:			**7.167**

TABLE 5 CONTINUED
CONTROL MEASURES AND EXPECTED VOC EMISSIONS REDUCTIONS
FOR THE 15 PERCENT RATE OF PROGRESS PLAN

CONTROL MEASURE	CREDITABLE/ NONCREDITABLE	IMPLEMENTATION DATE	EXPECTED EMISSIONS REDUCTIONS (TONS VOC/DAY)
Stationary Area Source Controls:			
RACT "Catch-Ups" in Kent County:			
Solvent Metal Cleaning	Creditable	May 31, 1995	0.134
Cutback Asphalt	Creditable	May 31, 1995	0.025
Subtotal for RACT in Kent County:			0.159
New RACT Regulations:			
Stage I Vapor Recovery - Gasoline Dispensing Facilities	Creditable	Nov 15, 1994	0.629
Emulsified Asphalt	Creditable	May 1993	0.052
Motor Vehicle Refinishing	Creditable	Apr 1, 1996	1.242
Offset Lithography	Creditable	Apr 1, 1996	0.070
Aerospace Coatings	Creditable	Apr 1, 1996	0.030
Subtotal for New RACT Regulations:			2.023
Stage II Vapor Recovery	Creditable	Nov 15, 1994	1.740
Open Burning	Creditable	Nov 1994	3.992
Total Stationary Area Source Reductions:			**7.914**
Off-Road Mobile Source Controls:			
Reformulated Fuel	Creditable	Jan 1, 1995	0.509
Total Off-Road Mobile Source Reductions:			**0.509**
On-Road Mobile Source Controls:			
FMVCP and RVP	Noncreditable	Pre-1990	24.120
Tier I Vehicle Emissions Standards	Creditable	Model Year 1994	0.170
a. Basic I/M for Kent County b. Pressure & ATP for Kent County	Creditable	Jan 1, 1991 Jan 1, 1995	1.420
Pressure & ATP in New Castle County	Creditable	Jan 1, 1995	2.180
Reformulated Fuel	Creditable	Jan 1, 1995	2.440
Total On-Road Mobile Source Reductions:			**30.330**
TOTAL REDUCTIONS FROM ALL CONTROL MEASURES:			**45.920**

The control measures in Table 5 are grouped by point, area, off-road mobile, and on-road mobile source categories depending on which source categories they affect. Several control measures affect both point and stationary area sources, and therefore are listed under both source categories. **For point, stationary area, and off-road mobile sources that will be subject to new controls by 1996, the emissions reductions are determined by subtracting the 1996 Control Strategy Projection emissions (discussed previously in Part III of this summary) from the 1996 Current Control Projection emissions (discussed in Part II of this summary).** The on-road mobile source reductions are determined through modeling as previously described.

The emissions reductions from each control measure are broken out by county in Table 6. Figure 5 shows the relative proportions of VOC reductions by source category for each county.

TABLE 6
EXPECTED VOC EMISSIONS REDUCTIONS BY COUNTY

CONTROL MEASURE	VOC EMISSIONS REDUCTIONS IN TONS PER DAY	
	KENT COUNTY	NEW CASTLE COUNTY
Point Source Controls:		
RACT "Catch-Ups" in Kent County:		
Solvent Metal Cleaning	0.582	N/A
Surface Coating of Metal Furniture	0.039	N/A
Leaks from Synthetic Organic Chemical, Polymer, and Resin Manufacturing Equipment	0.004	N/A
New RACT Regulations:		
Bulk Gasoline Marine Tank Vessel Loading Facilities	N/A	1.896
SOCMI Reactor Processes and Distillation Operations	N/A	0.024
Batch Processing Operations	0.370	0.036
Offset Lithography	N/A	0.078
Aerospace Coatings	0.004	0.004
Industrial Cleaning Solvents	N/A	0.499
Non-CTG RACT	0.148	0.211
Benzene Waste Rule	N/A	1.733
Sanitary Landfills	0.057	0.101
Irreversible Process Changes	0.708	0.673
Total Point Source Reductions:	**1.912**	**5.255**

TABLE 6 CONTINUED
EXPECTED VOC EMISSIONS REDUCTIONS BY COUNTY

CONTROL MEASURE	VOC EMISSIONS REDUCTIONS IN TONS PER DAY	
	KENT COUNTY	NEW CASTLE COUNTY
Stationary Area Source Controls:		
RACT "Catch-Ups" in Kent County:		
Solvent Metal Cleaning	0.134	N/A
Cutback Asphalt	0.025	N/A
New or Revised RACT Regulations:		
Stage I Vapor Recovery - Gasoline Dispensing Facilities	0.476	0.153
Emulsified Asphalt	0.026	0.026
Motor Vehicle Refinishing	0.249	0.992
Offset Lithography	0.069	0.001
Aerospace Coatings	N/A	0.030
Stage II Vapor Recovery	0.414	1.326
Open Burning	0.935	3.057
Total Area Source Reductions:	**2.329**	**5.585**
Off-Road Mobile Source Controls:		
Reformulated Fuel	**0.066**	**0.443**
On-Road Mobile Source Controls:		
FMVCP and RVP	8.220	15.900
Tier I Vehicle Emissions Standards	0.040	0.130
a. Basic I/M for Kent County b. Pressure & ATP for Kent County	1.420	N/A
Pressure & ATP in New Castle County	N/A	2.180
Reformulated Fuel	0.580	1.860
Total On-Road Mobile Reductions:	**10.260**	**20.070**
Total Reductions From All Control Measures:	**14.567**	**31.353**

Figure 5 here. from joanne

PART IV

CONTINGENCY MEASURES

The CAAA requires states with nonattainment areas to provide for the implementation of specific control measures to be undertaken if the area fails to make reasonable further progress, fails to meet any applicable milestone, or fails to attain the national ambient air quality standard by the applicable attainment date.[7] The EPA has interpreted this CAAA provision to require states with moderate and above ozone nonattainment areas to include sufficient contingency measures in the Rate of Progress Plans so that, upon implementation of such measures, additional emissions reductions of up to 3 percent of the emissions in the adjusted base year inventory would be achieved. Contingency measures must be fully adopted so that, upon failure to meet a milestone, the contingency measures may be implemented without any further rulemaking activities by the state. Delaware has adopted rules for the contingency measures discussed in the following paragraphs.

The reductions from contingency measures must amount to a minimum of 3% of the 1990 Adjusted Base Year Inventory for VOC's. This amount is calculated to be:

1990 Adjusted Base Year Inventory = 136.253 tons VOC/day

3% Contingency Measures = 0.03 x 136.253 = 4.088 tons VOC/day

Stage II Vapor Recovery

The CAAA requires states with moderate and above ozone nonattainment areas to submit a SIP revision requiring owners or operators of gasoline dispensing systems to install and operate a system for gasoline vapor recovery of emissions from the fueling of motor vehicles.[8] Delaware's current Stage II Vapor Recovery program, which is defined in Section 36 of Delaware Air Regulation 24, includes state inspections of affected facilities every three years. Delaware took credit for VOC emissions reductions from a Stage II Vapor Recovery Program with triannual inspections as part of its required 15% reduction. Emissions reductions from this type of program are estimated using a 65.3% rule effectiveness value according to the EPA. The rule effectiveness value increases to 90.5% if the Stage II Vapor Recovery program is conducted with annual state inspections. That is, the program is more effective at reducing VOC emissions with a higher inspection frequency. Therefore, Delaware will implement an annual inspection program for Stage II Vapor Recovery as a contingency measure. The additional VOC reduction generated by implementing annual inspections for Stage II Vapor Recovery is 0.619 tons VOC per peak ozone season day.

---

[7]CAAA, Title I, Part D, Sec. 172(c)(9) and Sec. 182(c)(9)

[8]CAAA, Title I, Part D, Sec 182(b)(3)

Open Burning

Delaware has adopted revisions to its open burning regulation which include more stringent restrictions than the previous version. A portion of the VOC emissions reductions resulting from the open burning regulation will be used as contingency measures.

The VOC emissions reduction from the revised open burning regulation is calculated to be 7.461 tons VOC per peak ozone season day. However, not all of the 7.461 tons/day is needed to meet the 3% contingency measure requirement. The percent of VOC reduction needed to meet the 3% contingency measure requirement was previously calculated to be 4.088 tons VOC/day. Of this amount, 0.619 tons VOC/day will be realized from the increased inspection frequency for the Stage II Vapor Recovery Program as previously discussed. Therefore, the amount of VOC emissions reduction needed from open burning is:

4.088 - 0.619 = 3.469 tons VOC/day

Consequently, of the total 7.461 tons VOC/day reduction that will be realized from open burning, 3.469 tons/day is included in the contingency measures and the remaining 3.992 tons/day is included in the 15% Plan.

A summary of the contingency measures and their emissions reductions is included in Table 8.

TABLE 8
EMISSIONS REDUCTIONS FROM CONTINGENCY MEASURES

Contingency Measures	**VOC Emissions Reductions (TPD)**
Stage II Vapor Recovery with Annual Inspections	0.619
Open Burning	3.469
Total	**4.088**